GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

JUNE 2023

GRADE 11

PHYSICAL SCIENCES: PHYSICS
PAPER 1

TIME: 2 hours

MARKS: 100

9 pages + 2 data sheets and a graph paper

INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate space on the ANSWER BOOK.
2. This question paper consists of NINE questions. Answer ALL the questions in the ANSWER BOOK.
3. Start each question on a NEW page in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEETS.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round-off your FINAL numerical answers to a minimum of TWO decimal places.
11. Give brief motivations, discussions, et cetera, where required.
12. Write neatly and legibly.

QUESTION 1 MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A – D) next to the question number (1.1 to 1.6) in the ANSWER BOOK, for example 1.7 A.

1.1 Which of the following statements about an electric field is CORRECT?

A Electric field strength is measured in V.m.
B The direction of the field lines indicates the direction of the force on a test negative charge.
C Electric field strength is a scalar quantity.
D The electric field strength due to a point charge is inversely proportional to the square of the distance from the charge. (2)

1.2 A negatively charged object …

A has more electrons than neutrons.
B has more protons than neutrons.
C has an equal amount of electrons and protons.
D has more electrons than protons. (2)

1.3 The current is induced in a solenoid. Which of the following factors will NOT affect the potential difference induced across the ends of the solenoid?

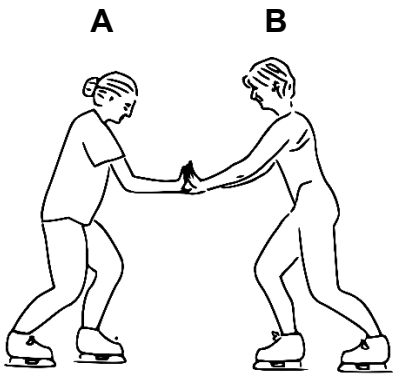
A The rate of change of the magnetic field used
B The resistance of the solenoid
C The number of turns in the solenoid
D The strength of the magnetic field (2)

1.4 Two planets exert a force on each other. The force is …

A directly proportional to the product of their masses.
B directly proportional to the distance between them.
C directly proportional to the square of the distance between them.
D inversely proportional to the square of the distance between them. (2)

1.5 Two learners, with the same mass, **A** and **B** on ice skates are facing each other on the ice rink. They press hard with their hands on one another.

Which of the following statements is correct?



A A will move away faster than B.
B B will move away faster than A.
C Both will move at the same speed in opposite directions.
D Both will move at the same velocity. (2)

1.6 The correct term for the rate of flow of charge is:

A Current
B Potential difference
C Resistance
D Power (2)

[12]

QUESTION 2 (Start on a new page.)

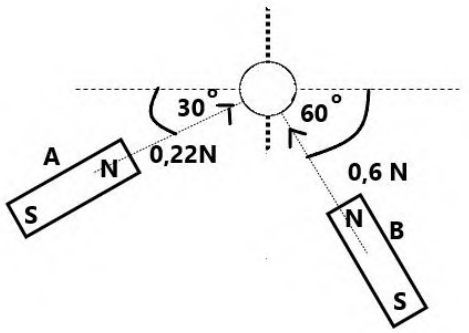
A boy of 32 kg is sitting in the centre of a swing as shown in the diagram below. Ignore the mass of the seat. The swing hangs evenly.

2.1 Define the term *resultant force*. (1)

2.2 State the magnitude of the resultant or net force on the boy if the seat of the swing hangs evenly. (1)

2.3 Calculate the tension in each of the ropes of the swing. (3)

2.4 A small steel ball is levitated (suspended in the air), by the forces of two magnets working in on it, at angles as shown in the diagram below. Magnet **A** exerts a force of 0,22 N at an angle of 30° to the horizontal and up on the steel ball. Magnet **B** exerts a force of 0,6 N at an angle of 60° to the horizontal and up on the steel ball. (Hint: Use the triangle rule for equilibrium.)



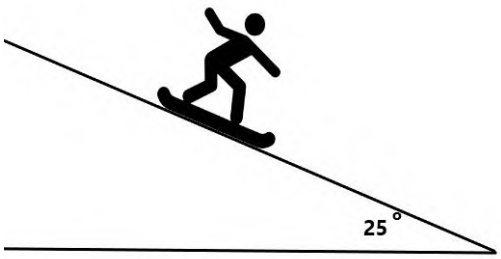
2.4.1 State *Newton's first law* in words. (2)

2.4.2 Calculate the mass of the steel ball. (4)

[11]

QUESTION 3 (Start on a new page.)

A child, with a mass of 40 kg on a sandboard with a mass of 1,5 kg, skis down a sand dune with an incline of 25°. The coefficients of friction for the sand is: μ_s = 0,3 and μ_k = 0,12.



3.1 Identify the type of friction that is acting on the child with the board and the sand. (1)

3.2 Draw a free body diagram of all the forces acting on the child. (3)

3.3 Calculate the frictional force the child will experience. Show ALL workings. (4)

3.4 The child tries to ski down a sand dune with an incline of 30°. Will the frictional force experienced INCREASE, DECREASE OR REMAIN THE SAME? Explain the answer. (3)

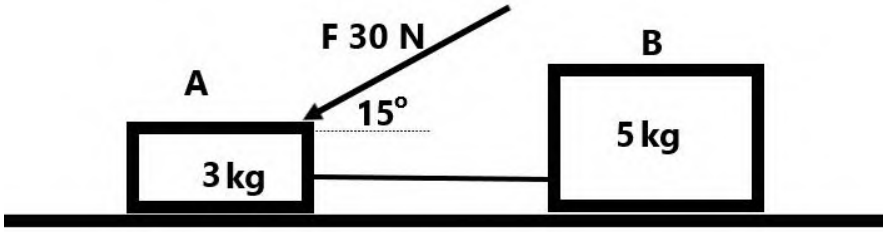
[11]

QUESTION 4 (Start on a new page.)

Two blocks **A** and **B**, with masses 3 kg and 5 kg, are connected by a light inextensible string.

Block **A** experiences a pushing force of 30 N acting at an angle of 15° to the horizontal, as shown in the diagram below.

Block **A** experiences a frictional force of 9,28 N and block **B** experiences a frictional force of 12,25 N during its motion. The system accelerates to the left.



4.1 Define *Newton's second law* in words. (2)

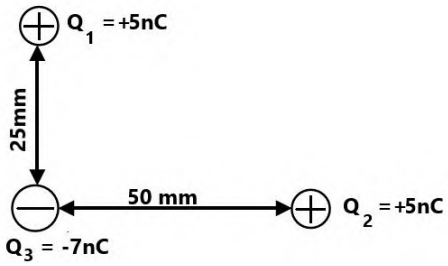
4.2 Draw a free body diagram to show all the forces acting on block **A**. (5)

4.3 Calculate the magnitude of the acceleration of the system by applying Newton's second law of motion SEPARATELY to each of the blocks. (4)

[11]

QUESTION 5 (Start on a new page.)

Study the accompanying diagram that represents the charges situated on a flat plane with respect to each other. The positive charges Q_1 and Q_2 are identical with charges of +5 nC each and are respectively placed north and east of Q_3 with a charge of – 7 nC. The distances between the charges are 25 mm and 50 mm as indicated in the diagram.



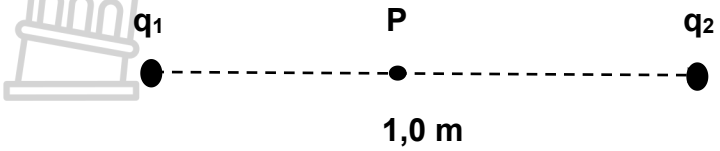
5.1 State *Coulomb's law* in words. (2)

5.2 Calculate the magnitude of the net electrostatic force that Q_3 experiences. (5)

[7]

QUESTION 6 (Start on a new page.)

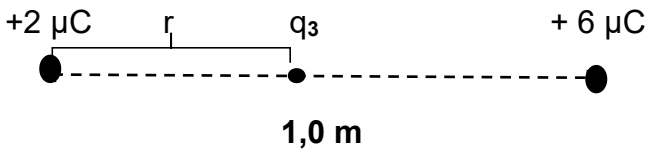
Two-point charges q_1= +2,0 µC and q_2= -2,0 µC, 1 m apart, are placed in vacuum as shown in the sketch below.



6.1 Draw the electric field pattern due to the two-point charges. (3)

6.2 Calculate the magnitude of the electric field at the midpoint between charges q_1 and q_2. (4)

Point-charge q_2 is now replaced by a +6 µC charge as shown in the sketch below.

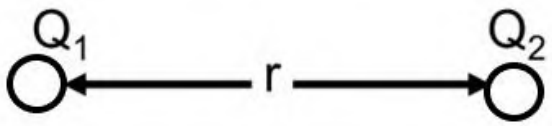


6.3 Determine by means of a calculation where a negative point charge ($-q_3$) must be placed with reference to the charge on the left (+2µC) so that it experiences a ZERO net force. (4)

[11]

QUESTION 7 (Start on a new page.)

A group of physicists wants to investigate the relationship between the electrostatic force experienced by two-point charges and the distance between the point charges, as indicated in the diagram below.



They record the following results:

Test	r (cm)	r^2 (cm^2)	F (N)
1	2	4	359,50
2	3	9	149,64
3	4	16	89,88
4	5	25	52,29
5	6	36	38,65

7.1 Write a suitable investigative question for this investigation. (2)

7.2 Identify the following variables:

7.2.1 Independent variable (1)

7.2.2 Controlled variable (1)

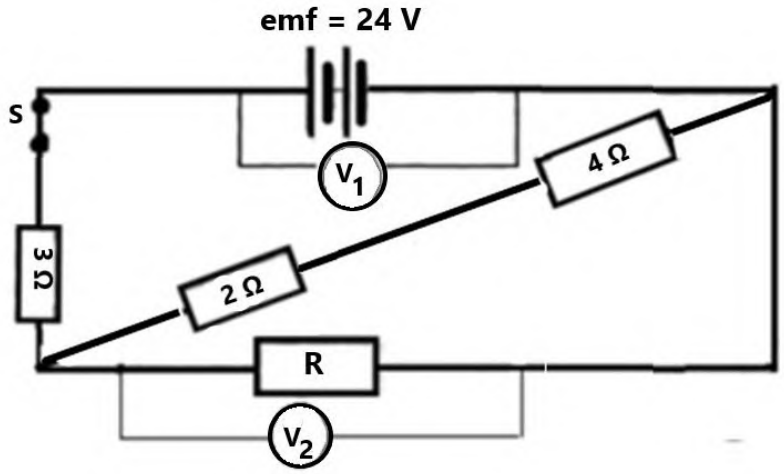
7.3 On the graph provided, draw an accurate graph of r^2 versus F. (5)

7.4 From the graph you have drawn, what conclusion can you make about the relationship between distance and force for two-points? (2)

[11]

QUESTION 8 (Start on a new page.)

In the circuit diagram below, resistors are connected in parallel as well as in series. The battery has an emf of 24 V and no internal resistance. When switch S_1 is closed the reading on V_2 is 9 V./



8.1 Define the term *potential difference*. (2)

8.2 Calculate:

8.2.1 The current through the 3 Ω resistor (3)

8.2.2 The current through the 4 Ω and 2Ω resistor (2)

8.2.3 The resistance on R (4)

8.3 The 4 Ω resistor burns out. What will happen to the current in the circuit? Write only INCREASES, DECREASES or REMAINS THE SAME. Explain the answer. (3)

[14]

QUESTION 9 (Start on a new page.)

A single circular loop of wire, 12 cm in diameter, is placed in a 0,6 T magnetic field. It is removed from the magnetic field in 0,04 s.

9.1 State *Faraday's law of electromagnetic induction* in words. (2)

9.2 Calculate:

9.2.1 The magnetic flux which is linked to this coil (3)

9.2.2 The average induced emf (4)

9.3 How does the emf change if the coil is removed from the field in 0,02 s? Write only INCREASES, DECREASES or REMAINS THE SAME. Explain the answer. (3)

[12]

TOTAL: 100

END

DATA FOR PHYSICAL SCIENCES GRADE 11
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11
VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/*TABEL 1: FISIESE KONSTANTES*

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	9,8 $m \cdot s^{-2}$
Gravitational constant *Swaartekragkonstante*	G	6,67 x 10^{-11} $N \cdot m^2 \cdot kg^{-2}$
Radius of Earth *Straal van Aarde*	R_E	6,38 x 10^6 m
Coulomb's constant *Coulomb se konstante*	K	9,0 x 10^9 $N \cdot m^2 \cdot C^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	3,0 x 10^8 $m \cdot s^{-1}$
Charge on electron *Lading op electron*	e	-1,6 x 10^{-19} C
Electron mass *Elektronmassa*	m_e	9,11 x 10^{-31} kg
Mass of the Earth *Massa van die Aarde*	M	5,98 x 10^{24} kg

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/BEWEGING

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t$

FORCE/*KRAG*

$F_{net} = ma$	$w = mg$
$F = \frac{Gm_1m_2}{r^2}$	$\mu_s = \frac{f_{s(max)}}{N}$
$\mu_k = \frac{f_k}{N}$	

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$v = f\lambda$	$T = \frac{1}{f}$
$n_i \sin\theta_i = n_r \sin\theta_r$	$n = \frac{c}{v}$

ELECTROSTATICS/*ELEKTROSTATIKA*

$F = \frac{kQ_1Q_2}{r^2}$ $(k = 9{,}0 \times 10^9\ N{\cdot}m^2{\cdot}C^{-2})$	$E = \frac{F}{q}$
$E = \frac{kQ}{r^2}$ $(k = 9{,}0 \times 10^9\ N{\cdot}m^2{\cdot}C^{-2})$	$V = \frac{W}{Q}$

ELECTROMAGNETISM/*ELEKTROMAGNETISME*

$\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$	$\Phi = BA\cos\theta$

CURRENT ELECTRICITY/*ELEKTRIESE STROOMBANE*

$I = \frac{Q}{\Delta t}$	$R = \frac{V}{I}$
$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \ldots$	$R = r_1 + r_2 + r_3 + \ldots$
$W = Vq$ $W = VI\Delta t$ $W = I^2R\Delta t$ $W = \frac{V^2\Delta t}{R}$	$P = \frac{W}{\Delta t}$ $P = VI$ $P = I^2R$ $P = \frac{V^2}{R}$

/ / /

ANSWER SHEET

QUESTION 7.3.

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION/ *PROVINSIALE EKSAMEN*

JUNE/*JUNIE* 2023

GRADE/GRAAD 11

MARKING GUIDELINES/ *NASIENRIGLYNE*

PHYSICAL SCIENCES: (PHYSICS) PAPER 1
FISIESE WETENSKAPPE:* (FISIKA) *VRAESTEL 1

12 pages/*bladsye*

QUESTION/*VRAAG* 1

1.1 D ✓✓ (2)

1.2 D ✓✓ (2)

1.3 B ✓✓ (2)

1.4 A ✓✓ (2)

1.5 C ✓✓ (2)

1.6 A ✓✓ (2)

[12]

QUESTION/*VRAAG* 2

2.1 The vector sum of two or more vectors. ✓
Die vektorsom van twee of meer vektore. ✓

OR/*OF*

The single vector having the same effect as two or more vectors together. ✓
Die enkele vektor wat dieselfde effek as twee of meer vektore saam het. ✓ (1)

2.2 Zero net/resultant force ✓ **OR** F_{net} = 0N
Zero net/resultante krag ✓ ***OF*** F_{net} = *0N* (1)

2.3 $F_g = m \times g$

$= 32 \times 9,8$ ✓

= 313,6 N downwards/*afwaarts*

$F_{net\,y}$ = 0 N ∴ $T_{up} = F_g$ and $T_1 = T_2$ (swing hangs evenly/ *swaai hang gelyk*) ✓

2 T = 313,60

T = 156,80 N upwards in each rope/*opwaarts in elke tou* ✓

Marking Guideline/*Nasienriglyn*:
- ✓ Substituting m and g/*Substitusie van m en g*
- ✓ Reasoning of size and formula of T's/ *Beredenering van grootte en formule van T's*
- ✓ Final answer with direction/*Finale antwoord met rigting*.

(3)

2.4 2.4.1 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it. ✓✓
'n Voorwerp sal in sy toestand van rus of beweging teen 'n konstante snelheid volhard tensy 'n nie-nul resultante/netto krag daarop inwerk. ✓✓ (2)

2.4.2 $F_g^2 = F_A^2 + F_B^2$

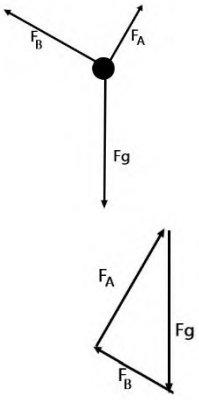
$= \sqrt{0,22^2 + 0,6^2}$ ✓

Fg = 0,639 N

Fg = m x g ✓

0,639 = m x 9,8 ✓

m = 0,0652 kg ✓

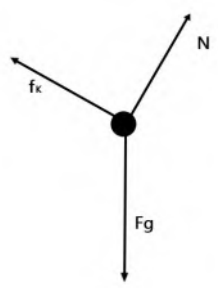


(4)
[11]

QUESTION/*VRAAG* 3

3.1 Kinetic friction/*Kinetiese wrywing* ✓✓ (1)

3.2



Marking criteria/*Nasien kriteria*:
All arrows, directions and headings should be correct.
Alle pyltjies, rigtings en byskrifte moet korrek wees.
✓ f_K
✓ N
✓ Fg

(3)

3.3 $F_{net\perp} = 0$ N ✓

∴ N = Fg⊥

= 41,5 x 9,8 x cos 25° ✓

= 368, 60 N ⊥ up/*opwaarts* (368,595 N)

$f_K = \mu_K$ N ✓

= 0,12 x 368,60

= 44,23 N up/incline/*teen helling op* ✓ (4)

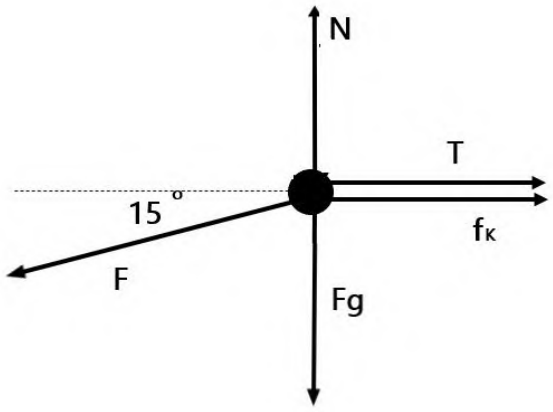
3.4 DECREASE/*AFNEEM* ✓

The coefficient of friction is a constant for a specific surface. ✓ An increase of the incline will decrease Fg ⊥ and therefore the normal ∴ f_K will decrease as f_K is directly proportional to the normal. ✓
Die koëffisiënt van wrywing is konstant vir 'n spesifieke oppervlakte ✓ 'n Toename in die helling sal Fg ⊥ verminder en daarom ook die normaal ∴ sal f_K afneem aangesien f_K direk eweredig is aan die normaal ✓ (3)
[11]

QUESTION/*VRAAG* 4

4.1 When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration directly proportional to the force and inversely proportional to the mass of the object. ✓✓/*Wanneer 'n resultante/netto krag op 'n voorwerp inwerk sal die voorwerp in die rigting van die krag versnel. Die versnelling is direk eweredig aan die krag en omgekeerde eweredig aan die massa van die voorwerp.* ✓✓ (2)

4.2



Marking criteria/*Nasien kriteria*:
All arrows, directions and headings should be correct.
Alle pyltjies, rigtings en byskrifte moet korrek wees.
- ✓ Normal N/*Normaal N*
- ✓ f_K
- ✓ Fg
- ✓ F
- ✓ T (5)

-1 for no arrow/extra force.
-1 vir geen pyltjie/ekstra krag.

(5)

4.3 $F_{net\ A}$ = mxa ✓ = + F_x - f_k - T

3a = (30 x cos 15) ✓ - 9,28 - T

3a = 19,70 - T…… (1)

$F_{net\ B}$ = mxa = +T - f_k

5a = +T -12,25 ……..(2)

(1 + 2) ✓

3a = 19,70 - T…… (1)

5a = +T -12,25 ……..(2)

8a = 7,45

a = 0,931 m.s^{-2} ✓ (0,93125 m.s^{-2})

Marking Guideline/*Nasienriglyne*:
- ✓ Formula /*Formule* Fnet = mx a
- ✓ Substituting Fx/*Substitusie van Fx*
- ✓ Adding of equations/*Optel van vergelykings*
- ✓ Final answer with units (magnitude asked)/*Finale antwoord met eenhede(grootte gevra)*

(4)

[11]

QUESTION/*VRAAG* 5

5.1 The magnitude of the electrostatic force exerted by two-point charges (Q_1 and Q_2) on each other is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance (r) between them. ✓✓

Die grootte van die elektrostatiese krag uitgeoefen deur twee puntladings (Q_1 en Q_2) op mekaar is direk eweredig aan die produk van die grootte van die ladings en omgekeerd aan die kwadraat van die afstand (r) tussen hulle. ✓✓ (2)

5.2 $F_{Q1+Q3} = \frac{kQ_1Q_3}{r^2}$ ✓

$= \frac{9 \times 10^9 \times 5 \times 10^{-9} \times 7 \times 10^{-9}}{(25 \times 10^{-3})^2}$ ✓

$= 5,04 \times 10^{-4}$ N up/North

$F_{Q1+Q3} = \frac{kQ_2Q_3}{r^2}$

$= \frac{9 \times 10^9 \times 5 \times 10^{-9} \times 7 \times 10^{-9}}{(50 \times 10^{-3})^2}$ ✓

$= 1,26 \times 10^{-4}$ N to the right/East/ *regs/Oos* ✓

$F_{net}^2 = F_1^2 + F_2^2$

$= \sqrt{(5,04 \times 10^{-4})^2 + (1,26 \times 10^{-4})^2}$

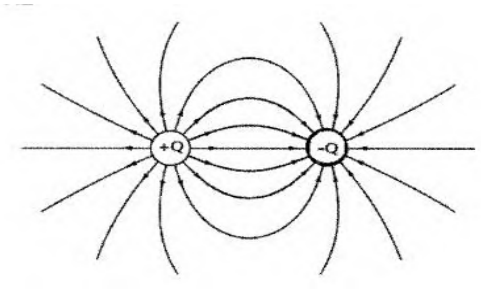
$= 5,195 \times 10^{-4}$ N ✓ ($5,20 \times 10^{-4}$ N)

Marking Guideline/*Nasienriglyne*:
- ✓ Formula Coulomb's Law/ *Formule Coulomb se wet*
- ✓ First substitution. (if -7nC marking stops)/ *Eerste substitusie. (indien -7nC geen verdere nasien*)
- ✓ Second substitution. (if -7nC marking stops) *Tweede substitusie. (indien -7nC geen verdere nasien*
- ✓ Adding of equations/ *Bymekaartel van vergelykings*
- ✓ Answer with units and direction/ *Antwoord met eenheid en rigting*

(5)
[7]

QUESTION/*VRAAG* 6

6.1



Criteria/*Kriteria*	Marks/*Punte*
Shape of field line between charges/*Vorm van veldlyne tussen ladings*	1
All other rules applied/*Alle ander reëls van toepassing*	1
Direction of field lines/*Rigting van veldlyne*	1

(3)

6.2 $E_{+2\ \mu C} = \frac{KQ}{r^2}$ ✓ $E_{-2\ \mu C} = \frac{KQ}{r^2}$

$= \frac{(9\ x\ 10^9)(2\ x\ 10^{-6})}{0,5^2}$ ✓ $= \frac{(9\ x\ 10^9)(2\ x\ 10^{-6})}{0,5^2}$

= 7,20 X 10^4 N.C^{-1} to the right/*na regs* = 7,20 X 10^4 N.C^{-1} to the right/*na regs*

$E_{net} = E_{+2\ \mu C} + E_{-2\ \mu C}$

= 7,20 X 10^4 + 7,20 X 10^4 ✓ any one/*enige een*

= 1,44 X 10^5 N.C^{-1} ✓

(4)

6.3 $F_{net} = F_{1on3} + F_{2on3}$

$F_{net} = \frac{kQ_1Q_3}{r^2} - \frac{kQ_2Q_3}{r^2}$ ✓ any one/*enige een*

0 ✓$= \frac{kQ_1Q_3}{r^2} - \frac{kQ_2Q_3}{r^2}$

$\frac{kQ_1Q_3}{r^2} = \frac{kQ_2Q_3}{r^2}$

$\frac{Q_1}{r^2} = \frac{Q_2}{r^2}$

$\frac{2\,x\,10^{-6}}{x^2} = \frac{6\,x\,10^{-6}}{(1-x)^2}$ ✓

$\frac{2}{x^2} = \frac{6}{(1-x)^2}$

$4x^2 + 4x - 2 = 0$

X = 0,37 m from charge 2 µC/*0,37m vanaf lading 2 µC* ✓ (4)

[11]

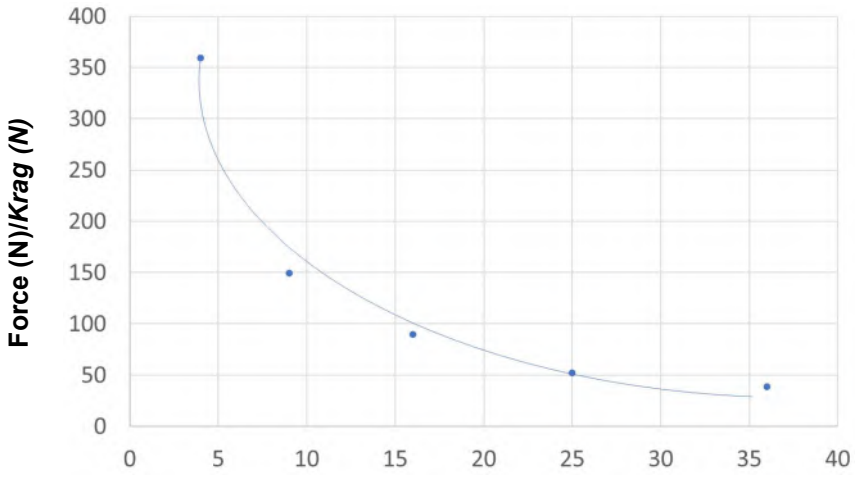
QUESTION/*VRAAG* 7

7.1 What is the relationship between the electrostatic force between two charges and the distance between the charges? ✓✓/
Wat is die verband tussen die elektrostatiese krag tussen twee ladings en die afstand tussen die ladings ✓✓ (2)

7.2 7.2.1 Distance/*Afstand* ✓ (1)

7.2.2 Magnitude of the charges/*Grootte van die ladings* ✓ (1)

7.3 **Graph of Force versus distance squared (r2)/**
Grafiek van Krag teenoor afstand kwadraat (r2)



✓ Heading/*Opskrif*
✓ Scales/*skaal*
✓ Correct x-axis label and units and correct y-axis label and units
(Both must be correct to be able to allocate this mark.)/
Korrekte x-as byskrif en eenhede en korrekte y-as byskrif en eenhede
(Beide moet korrek wees vir die toekenning van die punt.)
✓ Plotting of points/*Plot van punte*
✓ Smooth curved line of best fit/*Gladde geronde lyn van beste passing* (5)

7.4 As the distance increases, the force decreases exponentially./As the distance decreases, the force decreases exponentially. ✓
Force and distance between charges are inversely square proportional. ✓
(Not inversely proportional.)/
Soos wat die afstand toeneem neem die krag eksponesieël af./Soos wat die afstand afneem neem die krag eksponensiëel toe ✓
Krag is omgekeerd eweredig aan die kwadraat van die afstand tussen die ladings.
(Nie omgekeerd eweredig nie.) ✓ (2)

[11]

QUESTION/*VRAAG* 8

8.1 The energy that could be transferred per coulomb/unit charge in a circuit. ✓✓
Die energie wat oorgedra kan word per coulomb/eenheidslading in 'n stroombaan. ✓✓ (2)

8.2.1 $I = \frac{V_{3\Omega}}{R}$ ✓

$= \frac{24 - 9}{3}$ ✓

$= 5$ A ✓ (3)

8.2.2 $V_{4+2\Omega} = I \times R$

$9 = I \times 6$ ✓

$I = 1,5$ A ✓ (2)

8.2.3 $I_R = I_{total} - I_{4+2\Omega}$

$= 5 - 1,5$ ✓

$= 3,5$ A ✓

$R = \frac{V}{I}$

$= \frac{9}{3,5}$ ✓

$= 2,57\ \Omega$ ✓ (4)

8.3 DECREASES/*NEEM AF* ✓

The total resistance will increase, ✓ resistance is inversely proportional to the current in the circuit. ✓ Thus, the current will decrease.
Die totale weerstand sal toeneem ✓ weerstand is omgekeerd eweredig aan die stroom in die stroombaan ✓. Dus sal die stroom afneem. (3)
[14]

QUESTION/*VRAAG* 9

9.1 The magnitude of the induced emf across the ends of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor. (When a conductor is moved in magnetic field, a potential difference is induced across the conductor.) ✓✓
Die grootte van die geïnduseerde emk oor die ente van die geleier is direk eweredig aan die tempo van verandering van magnetiese vloedkoppeling met die geleier. (Wanneer die geleier uit die magneetveld beweeg word, word 'n potensiaalverskil geïnduseer oor die ente van die geleier.) ✓✓ (2)

9.2 9.2.1 $\Phi = BA \cos \theta$ ✓

$= (0,6)\ \pi\ r^2 \cos \theta$

$= \underline{(0,6)(\pi \times 0,06^2)}\ \cos 0°$ ✓

$= 6,79 \times 10^{-3}$ Wb ✓ (3)

9.2.2 **POSITIVE MARKING FROM QUESTION 9.2.1**
POSITIEWE NASIEN VANAF VRAAG 9.2.1

$$\varepsilon = \frac{-N \Delta \Phi}{\Delta t} \checkmark$$

$$= \frac{(-1)(0 - 6,79 \times 10^{-3})}{0,04} \checkmark \checkmark$$

$= 0,17$ V ✓ (4)

9.3 INCREASES/*NEEM TOE*✓

The emf is inversely proportional to the time of rotation, ✓ thus if the time decreases, the emf will increase. ✓/*Die emk is omgekeerd eweredig aan die tyd van rotasie*✓ *dus as die tyd afneem sal die emk toeneem.* ✓ (3)
[12]

TOTAL/*TOTAAL*: 100

Taxonomy/*Taksonomie*

Weighting of Topics/*Gewig van onderwerpe*

Question/ *Vraag*	Mechanics/ *Meganika*	Electro-statics/ *Elektrostatika*	Electric circuits/ *Elektriese stroombane*	Electro-magnetism/ *Elektromagnetisme*	Question total/ *Vraag totaal*
1	4	4	2	2	**12**
2	12				**121**
3	11				**11**
4	11				**12**
5		7			**7**
6		11			**11**
7		11			**11**
8			13		**13**
9				12	**12**
Total mark/ *Totale punte*	38	33	15	14	**100**
Actual/ *Werklik*					**100%**
Target/ *Teiken*					**100%**

	Cognitive Levels			
Question no:	**Knowing science**	**Understanding science**	**Applying scientific knowledge**	**Evaluating, analysing, synthesising**
1.1		2		
1.2	2			
1.3		2		
1.4	2			
1.5		2		
1.6	2			
2.1	1			
2.2		1		
2.3			3	
2.4.1	2			
2.4.2			4	
3.1		1		
3.2		3		
3.3			4	
3.4				3
4.1	2			
4.2		5		
4.3			4	
5.1	2			
5.2			5	
6.1		3		
6.2			4	
6.3			4	
7.1		2		
7.2.1		1		
7.2.2		1		
7.3		5		
7.4		2		
8.1	2			
8.2			9	
8.3				3
9.1	2			
9.2.1			3	
9.2.2			4	
9.3			3	
Total mark	17	30	47	6
REQUIRED	15 %	35 %	40 %	10 %